



Guide's Guide

Kettle Ponds

Location Summary

Directions: Two ponds are visible off Route 6, just north of the Wellfleet/Truro boundary: Round Pond and Snow Pond. (Other ponds are on secondary roadways to the east of Wellfleet Center.)

Safety: Watch out for heavy traffic on Route 6.

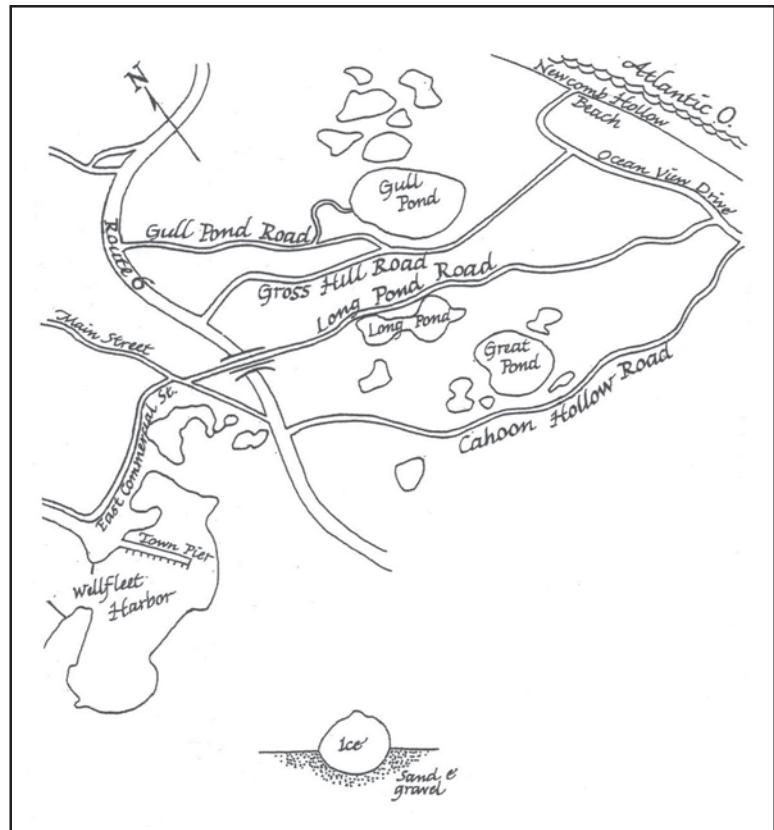
Other: Salt ponds are also kettle ponds, but are connected directly to ocean waters. Many freshwater ponds are operated as town swimming beaches. Ponds generally have only limited parking. Access in summer is usually restricted to residents or permit holders.

Tips: Alert passengers to views of ponds at Truro boundary to avoid having to slow down in traffic on Route 6.

Time Frame: Five-minute narration time on board bus. Forty-five minutes to one hour needed if on-site visit is made to ponds.

Notes for Educators: Ponds are an important component of the Cape's natural landscape. Access via town swimming beaches can often be arranged during off season (September-May) periods. Freshwater studies can be conducted at Seashore sites, such as, the Red Maple Swamp, Atlantic White Cedar Swamp, and Buttonbush Trail. Ponds are also a mirror of Cape Cod drinking water quality.

Highlights: More than 365 ponds on Cape Cod.
Thoreau visited Wellfleet ponds.
Pond studies reveal Cape Cod's past natural history.
Various Seashore sites contain freshwater habitats.
Ponds reflect status of Cape Cod's drinking water quality



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Prominent Natural Features

There are some 365 freshwater ponds on Cape Cod. Most of these are kettle ponds, formed when blocks of ice from the last glacier became imbedded or covered by outwash materials, leaving depressions that filled with fresh water when ground water rose to intersect them. A variety of deep, pristine kettles are located within the National Seashore's boundaries, including Gull pond off Gross Hill Road in Wellfleet, and Snow and Round Ponds which are visible from Route 6.

Freshwater kettle ponds fill in through natural processes and provide different habitats. Shallow, one-to-two foot deep ponds may harbor buttonbush shrubs (Button-bush Trail, Eastham). Foot-deep or less ponds often harbor water-tolerant red maple trees on their margins (Red Maple Swamp, Eastham). Other swampy portions of former deeper kettles serve as habitat for Atlantic white cedars, a species that is more prominent in southern regions of the U.S. (Atlantic White Cedar Swamp, Wellfleet).

Freshwater ponds also occur amid dunes, where freshwater tables are supported due to density differentials between saltwater and freshwater regimes. Such areas may provide habitat for additional vegetation types. The Beech Forest pond, for example, harbors a number of golden club plants within its quiet shallows. These plants are visible during the spring as yellow spikes protruding at an angle out of the water.

- ❖ *Kettle ponds need care in order to keep them pristine.*
- ❖ *Bathers should not use soap.*
- ❖ *Use restrooms located away from ponds.*
- ❖ *Pets are restricted from pond areas seasonally.*



Kettle Ponds

Touring Script

Cape Cod is blessed with a great many freshwater kettle ponds (as many as 365—one for every day of the year, according to one source). These ponds are unique, in that many of them have remained in a clear, pristine, natural condition.

The ponds on Cape Cod are a product of the Ice Age. When the glacial ice front retreated some 18,000 years ago, it left behind huge chunks of ice that were wholly or partially buried in the sandy outwash plain. As these ice blocks melted, the ground surface became indented.

Numerous “kettle holes” subsequently dotted the emerging Cape Cod landscape. Those with a layer of clay beneath them collected water early on. Others filled up when the freshwater table rose, and the bottoms of the kettles intersected the rising water level. This was enhanced, in part, by sea level rise (sea level was 400 feet lower during the end of the glacial period 18,000 years ago). The fresh water captured by rainfall in the sandy soil of Cape Cod lies above sea level partially because fresh water is approximately .40 lighter than salt water and floats on it (and partially due to the capillary action of the sandy soil).

Vernal Pools

Seasonal impoundments of water are known as “vernal pools.” These become important breeding grounds for many of the Cape’s amphibians, including the spring peepers, spotted salamanders, and the elusive spade foot toad.

More permanently wet depressions in the Cape’s landscape play host to a variety of bog habitats, including quaking bogs and Red Maple and Atlantic White Cedar Swamps.

Deeper ponds provide a much different environment. Freshwater ponds that are connected by active creeks or brooks to saltwater often serve as the final destination for herring (alewife) runs. During the spring, literally thousands of these “anadromous” fish return to their place of origin to spawn and lay eggs (and often die in the process) to renew the cycle that will begin with new “fry” returning to the ocean at the end of summer.

Many deep freshwater ponds, however, are not connected to other bodies of water, and rely solely on the flow of groundwater for inward and outward flow. Most of these ponds on the Outer Cape are still pristine. Henry David Thoreau stayed at the home of an old Wellfleet oysterman on one of these ponds during a visit in the mid-1800’s.

Today, Cape Cod National Seashore is working with local town and private co-owners of ponds located within the boundaries of Cape Cod National Seashore to encourage practices (such as restricting use of soap and the bringing of pets to ponds, etc.) that will assure long-term water clarity and purity.

Scientists have found that Cape ponds also hold another source of information. Pollen, diatoms and other remains of living organisms trapped in layers on the bottoms of these ponds serve as a historical record of vegetative types and climactic patterns. Pitch pine, for example, was generally less abundant than today. More southern species, such as Atlantic White Cedars, grew in greater numbers during warmer periods. One surprise is that Cape ponds have shown a history of being highly acidic—a natural condition that should not be altered.

Ponds are also a mirror of Cape Cod drinking water quality, as all Cape groundwater comes from rainwater and is subject to the same conditions that affect pond quality.

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Ponds of the Wellfleet/Truro Area

Scattered through Cape Cod National Seashore are twenty kettle ponds ranging in depth from six to sixty feet. The geologic origin of these ponds not only explains their existence, but why keeping them clean is so essential to the Cape's freshwater supply. The coastal plain pondshore community hosts several plant species that have been designated as rare or threatened by the Massachusetts Natural Heritage and Endangered Species Program.

When the glaciers that formed Cape Cod retreated 18,000 years ago, huge chunks of ice broke off. Melting glaciers left deposits of dirt, sand and rock that surrounded and covered these ice "cubes." Some of these chunks lasted hundreds of years. When the ice chunks finally melted, depressions formed as the glacial debris collapsed down into the area the ice once occupied. These holes are called kettles. In areas where they are deep enough to intersect the ground water, kettle ponds are formed.

All of the Cape's drinking water comes from a single source aquifer, a thin (usually less than three hundred feet thick) freshwater layer that floats on top of the denser salt water that surrounds us. You may be able to visualize this by thinking of a child's swimming pool filled with saltwater (the ocean). Cape Cod is like a mound of sand that reaches above the water. The spaces between the sand grains below the surface of the water will be filled with saltwater. When it rains, freshwater percolates down until it collects between the grains of sand above the saltwater, since freshwater is less dense than saltwater. This layer of freshwater is called the ground water. The top of this layer is called the water table. The only way more freshwater is added to this supply is through rain or other precipitation.

Windows to Our Drinking Water

Kettle ponds have been called "windows to our drinking water." The surface of the kettle pond is the surface of our ground water which is the source of our drinking water. Therefore, anything that is put into a kettle pond is eventually added to our drinking water. Anything that affects our ground water (including any pollutants spilled onto the ground) will eventually reach our kettle ponds. Unlike a flowing river or stream, which may flow at three feet per second, anything introduced to this system will remain for a very long time, since the rate of ground water flow is only three feet per day maximum.

There is a natural cycle for most ponds. In their youth, they are generally clear. As more plants and animals live and die in the pond, their remains decompose and provide food for other creatures as well as filling in the pond. A pond nearing the end of its life will be shallow with lots of plant life and will eventually fill in to become a marsh or swamp. This cycle may take thousands of years to naturally occur on Cape kettle ponds. The deep kettle ponds on the Cape are known for their clarity. On some ponds, there are times when you can see fish swimming thirty feet below. Why so clear? The Cape's sandy soils are nutrient-poor. The small amount of natural fertilizers limits the growth of the algae. However, humans can greatly accelerate it by adding nutrients to the ponds. How does this happen?

Most people are aware that introducing any type of soap (even biodegradable ones) to a pond will degrade its clarity. So will swimming in a pond after swimming in the ocean, if the salt is not rinsed off first. Wastes entering the system due to improper septic systems or urinating or defecating by humans or pets in or near the pond also fertilize it. If people trample plants near the pond edge, soil is eroded into the pond. All of these activities can cause the overgrowth of algae.

Ownership of ponds within the National Seashore is quite complicated. One pond may be shared by private owners, the towns and the National Park Service. Therefore, we are all responsible for the care of these special places.

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Ponds of the Wellfleet/Truro area continued

Questions to see who's been paying attention to their Cape Cod geology:

1. Kettle Ponds are not found north of High Head in North Truro. Why? This area was not here when the glaciers retreated. It was formed later from sediments eroded from south of High Head and redeposited as the Province Lands sand spit.
2. Salt Pond, located behind the Visitor Center in Eastham was once a freshwater kettle pond. What happened? The coastline was once two miles out to sea. The sea broke through the barrier beach dune system to form an inlet, changing the freshwater pond to saltwater.

Kettle Ponds

Henry David Thoreau

Henry David Thoreau (1817-1862), a historian, journalist and exceptional naturalist grew up in Concord, Massachusetts. He graduated from Harvard College, worked in his family's pencil business, taught school for a year and wrote for a magazine. *Walden*, his best known work, is an account of the two years he lived in a hut on Walden Pond in Concord. His famous essay, "Civil Disobedience," was important to the world as a guideline for later leaders, such as, Mahatma Gandhi and Martin Luther King, Jr.

Thoreau came to the Cape with the mind and eyes of one who had lived an inland life. The "naked nature" of the beach and ocean, and the habits of the Cape's natives sharply contrasted to the quiet of Walden Pond, the coziness of his hut at the edge of the pond, and the flourishing and civilized culture of Concord.

"Scrabble" for a Living

In *Cape Cod*, he writes about the interaction of the people and the harsh natural conditions. He explains what he perceived as the strange and alien ways of the residents as being caused by *a nature that was hostile and indifferent to human life*, and one that made Cape Codders *scrabble* for a living from the sea, shore and barren land. He saw a desert-like land without fence or tree in the plains of Nauset, *and winds that howl and snow that blows right merrily in the face of the traveler*:

Although his attention centered mainly on nature, he took notice of anything else on the Cape that touched his curiosity and imagination. He had little interest in the prosperous towns and the beautiful homes built by the successful sea captains, but he was fascinated by the beachcombers, wreckers and oystermen wrested a living from the ocean. Lighthouses, humane-society huts (built to provide shelter for shipwrecked crews) and saltworks that then made up a two-million dollar business on the Outer Cape, were all part of Thoreau's Cape Cod. The quotation that *lighthouse or fisherman's hut is the true hotel* gives a sense of what Thoreau regarded as important. As to houses, he found the *old fashioned and unpainted* houses the most comfortable.

Thoreau often critically evaluates and describes people. For example, in the chapter on the Wellfleet oysterman (who lived on a pond in Wellfleet), Thoreau's tone in portraying the family is harsh, without even gentle humor.

It rained on most of Thoreau's hikes: *We walked with our umbrellas behind us*. But many of us will agree with his thought about the Cape: *A storm in the fall or winter is the time to visit it*.

From Henry David Thoreau's Book, *Cape Cod*:

Every landscape which is dreary enough has a certain beauty to my eyes, and in this instance its permanent qualities were enhanced by the weather. Everything told of the sea, even when we did not see its waste or hear its roar. For birds there were gulls, and for carts in the fields, boats turned bottom upward against the houses, and sometimes the rib of a whale was woven into the fence by the roadside ...

The great number of windows in the ends of the houses, and their irregularity in size and position, here and elsewhere on the Cape, struck us agreeably,—as if each of the various occupants who had their cunabula behind had punched a hole where his necessities required it, and according to his size and stature, without regard to outside effect. There were windows for the grown folks, and windows for the children,-three or four apiece; as a certain man had a large hole cut in his barn-door for the cat, and another smaller one for the kitten.

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Henry David Thoreau *continued*

Sometimes they were so low under the eaves that I thought they must have perforated the plate beam for another apartment, and I noticed some which were triangulo-lar; to fit that part more exactly. The ends of the houses had thus as many muzzles as a revolver; and, if the inhabitants have the same habit of staring out the windows that some of our neighbors have, a traveler must stand a small chance with them.

We knocked at the door of the first house, but its inhabitants were all gone away. In the mean while, we saw the occupants of the next one looking out the window at us, and before we reached it an old woman came out and fastened the door of her bulkhead, and went in again. Nevertheless, we did not hesitate to knock at her door, when a grizzly-looking man appeared, whom we took to be sixty or seventy years old. He asked us, at first, suspiciously, where we were from, and what our business was; to which we returned plain answers.

“How far is Concord from Boston?” he inquired.

“Twenty miles by railroad.”

“Twenty miles by railroad,” he repeated.

“Didn’t you ever hear of Concord of Revolutionary fame?”

“Didn’t I ever hear of Concord? Why, I heard guns fire at the battle of Bunker Hill. [They hear the sound of heavy cannon across the Bay.] I am almost ninety; I am eighty-eight year old. I was fourteen year old at the time of Concord Fight-and where were you then?”

We were obliged to confess that we were not in the fight.

But this shore will never be more attractive than it is now. Such beaches as are fashion-able are here made and unmade in a day, I may almost say, by the sea shifting its sands. Lynn and Nantasket! this bare and bended arm it is that makes the bay in which they lie so snugly. What are springs and waterfalls? Here is the spring of springs, the waterfall of water falls. A storm in the fall or winter is the time to visit it; a light-house or a fisherman’s but the true hotel. A man may stand there and put all America behind him.